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CONTENTS

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THE JOURNAL OF ENTOMOLOGY AND ZOOLOGY

William A. Hilton, Editor

Claremont, California, U. S. A.

A List of California Arachnida

V. PHALANGIDA OR HARVEST MEN

L. Myers

First three figures from Banks.

COSMETIDAE. Second pair of legs without endites. Pediplalps shorter than the body. Eye tubercles low.

Cynorta bimaculata Bks. San Diego. No spines or tubercles at caudal end of the body.

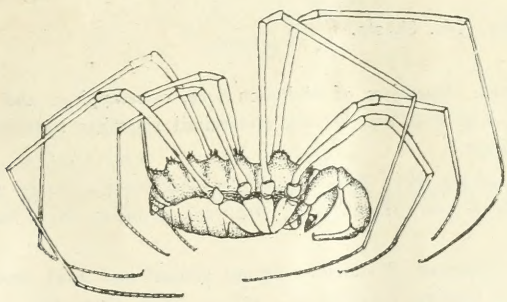
PHALANGODIDAE. Hind coxae united to first abdominal at base, free at apex. Second pair of legs distinct endites. Pediplalps large. Spiracles indistinct.

Sitalces californicus Bks. Martin Co. and Mt. Shasta.

Sclerobunus robustus Pack. Mt. Shasta region.

Scotolemon californica Bks. Alabaster Cave, Calif.

PHALANGIDAE. Last segment of the pedipalps long and armed with a claw. Coxa of fourth leg is united near its base on the posterior side to the tracheal sternite of the abdomen. Tibial spiracles are present.



Protolophus tuberculatus Bks. Gray to brown, more or less mottled. Abdomen often red-brown. Claremont, Santa Catalina, Santa Rosa.

P. singularis Bks. Near San Diego.

Mitopus californicus Bks. Los Angeles. Gray above, mottled, femora and tibia brown.

Globipes spinulatus Bks. Red-brown, base of legs yellowish. Eye tubercle low. S. Calif.

Leptobrunus californicus Bks. Whitish above, mottled with brown and black. Indefinite vase mark. Los Angeles and S. Calif.

Eurybunus brunneus Bks. Body very smooth; fourth leg nearly as long as second. S. Calif.

E. spinosus Bks. Gray above, black mark on each side of base of abdomen. Femora I and III brown, with a pale ring on middle.

Leiobunum bimaculatum Bks. Dark brown, two prominent yellow spots. Near San Diego.

L. exilipes Wood. Female dark rose mark on dorsal side. From N. Calif. to Claremont. Common in mts. near Claremont.

ISCHYROPSALIDAE. Last segment of pedipalps shorter than next to last, without claw. Coxa of fourth leg not fused with adjacent sternite of abdomen. No tibial spiracles.

Taracus spinosus Bks. Pale yellow, claw of mandibles red-brown. S. Calif.

T. pallipes Bks. Mt. Shasta.

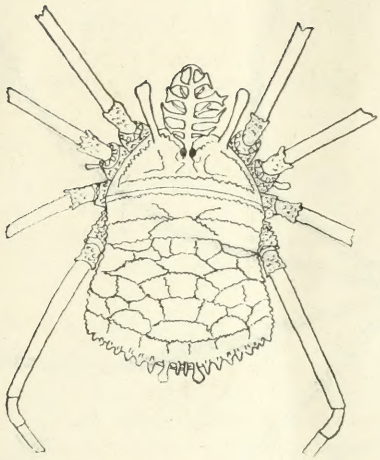
NEMASTOMATIDAE. Stermites of abdomen free, overlapping, and without median divisional sulcus. The first and second abdominal stermites narrowed in front and extended betwen coxae.

Nemastoma modesta Bks. Back brown to red-brown. Legs pale. From eye tubercle backwards a row of tubercles, flat tops broader than base. Mt. Shasta, Claremont.

TROGULIDAE. Stermites of abdomen except genital and anal, fused, do not overlap. They have a median longitudinal sulcus. The first and second abdominal sternites widely rounded in front and overlap the proximal parts of the two posterior pairs of coxae.

Ortholasma pictipes Bks. Eye tubercle. Four to five openings on a side. Humbolt Co. and Mt. Wilson.

O. rugosa Bks. Common in S. Calif.



Dendrolasma mirabilis Bks. Coulterville, Calif.
Pomona Jour. Ent. 1911, p. 412. Bull. III Nat. Hist. 1889 N. 3, p. 99.

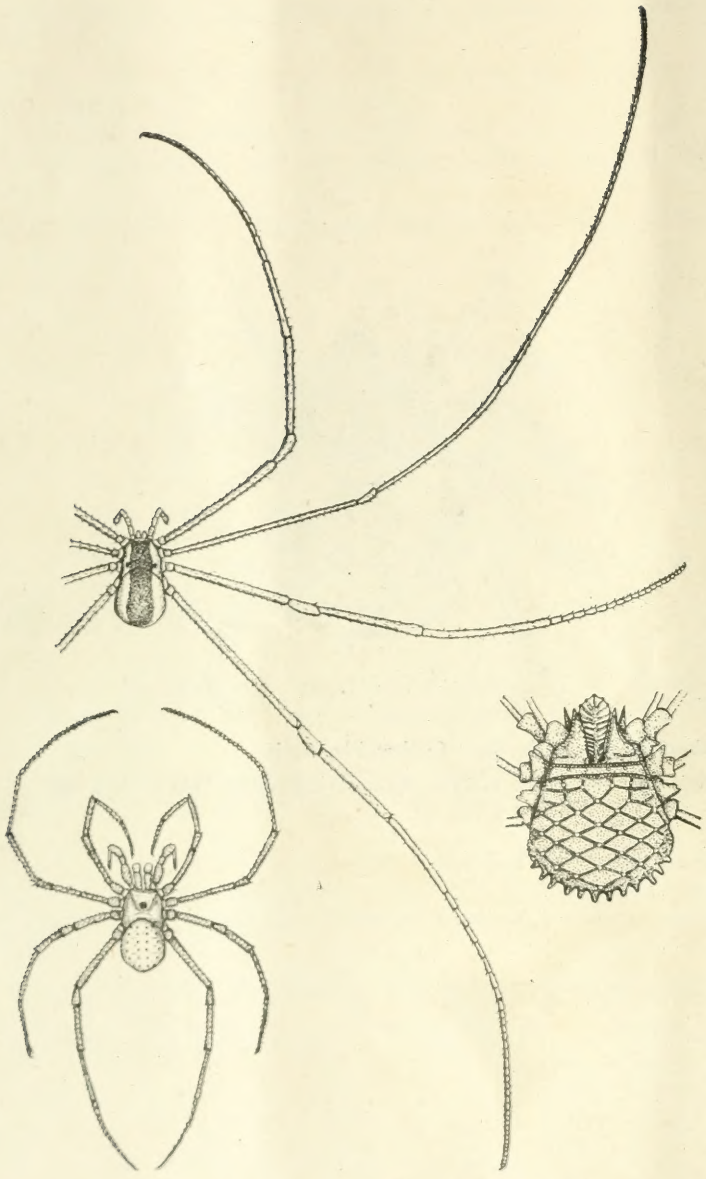


Figure above, *Leiobunum bimaculatum*. Below, *Protolophus tuberculatus*. Figure at the right, body of *Ortholasma pictipes*.

A List of California Arachnida

VI. ACARINA OR THE MITES AND TICKS

F. Cox, P. Jahraus, W. Moore

Figures from Hall, except the plate.

EUPODIDAE. Body divided into cephalothorax and abdomen. Palpi without thumb. Beak small. Eyes when present near posterior edge of the cephalothorax. Body soft. Moderate to very long legs. Palpi short. Mandibles small but chelate. Mostly on ground, predaceous.

Eupodes brevipes Bks. Body red, legs clear. Slender. Sides concave. Laguna Beach.

Rhagidia pallida Bks. Under stones, Claremont.

Penthaleus bicolor Bks. Spherical, dark body, red legs. Common Claremont.

BDELLIDAE. Snout mites. Skin not hard. Palpi 4-5 segments. Cephalothorax large, well separated from abdomen. Palpi large geniculate and bearing long tactile bristles. Mandibles chelate. Body elongate. Lives in moss, dead laves, etc. Predaceous.

Bdella peregrina Bks. Claremont, Chino.

B. lata Ewing. On live-oak, under stones, etc. Claremont.

B. californica Bks. Body white, legs, palpi yellowish beyond base. Body narrowed in front to beak. Eye each side cephalothorax, four hairs in front, longer one each side beyond eye. Abdomen a few short hairs above. Legs rather slender. Clarmont.

B. utilis Bks. from black scale.

ANYSTIDAE. Coxae contiguous, radiate. Legs slender, bristly. Body few hairs. No dorsal grove. Tarsi not swollen.

Erythraeus posticatus Bks. Palpi slender, a long thumb. Body dark red, legs pale. From bark of eucalyptus, Claremont.

E. augustipes Bks. Under stones, Claremont.

E. hiltoni Bks. Claremont.

Erythaeus sp. not mature, on phalangid, Palmer's canyon near Claremont and on horned toad Laguna Beach.

Tarsotomus terminalis Bks. Body slightly constricted in middle. Two eye spots in cephalothorax. Many long erect bristles. Claremont.

T. macropalpis Bks. Large species sparce bristles, body nearly twice as long as broad. Claremont.

TETRANYCHIDAE "Red spiders". "Palpus with thumb, body well clothed with hairs. Legs I and II without spine-like processes. Coxae not radiate. Legs usually in groups of two each. No dorsal grove on cephalothorax. Tarsi not swollen. Mandibles for piercing. Hair on body usually in four longitudinal rows. Body oval, few bristles. Suture between second and third pair of legs. Red, two to four eyes. Pedipalps four jointed, usually a strong claw on next to last joint.

Tetranychus simplex Bks. Date palm, El Centro.

T. mytilaspidis Riley. S. California on orange. This is the "citrus red-spider". Red in color, bristles arise from tubercles.

T. sexmaculatus Riley. In San Diego Co. in colonies in depressions covered with silk.

T. bimaculatus Harvey. On fruit trees, and food plants. Common on many plants.

Tetranychoides californicus Bks. On citrus trees.

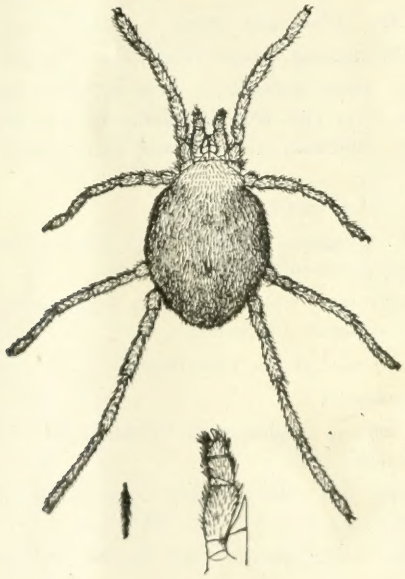
Tenuipalpus californicus Bks. Small flat, sometimes on citrus trees. Little damage.

Caligonus terminalis Bks. Red body. Chula Vista, San Diego. On lemon leaves, not abundant or important.

Bryobia pratensis Garman. In East called clover mite. In Calif. called almond mite. S. Calif. and north. Long front legs, four scale-like projections on front margin.

RHYCHOLOPHORIDAE. Skin not horny. Cephalothorax without special hairs. Legs in two groups. Palpi with last segment a thumb, while next to last ends in a claw. Cephalothorax large on same plane with abdomen, dorsal groove present.

Rhyncholophus moestus Bks. Red. Monrovia.



R. arenicola Hall. Bright red or straw color. Dry sand Laguna Beach.

R. gracilipes Bks. Santa Rosa I.

TROMBIDIIDAE. Harvest mites. Palpi geniculate, ending in one or two claws and with a thumb at the end. Coxae in groups. Body thickly dotted with short hairs, tarsi often swollen. Cephalothorax small and almost completely hidden by the projection of the anterior part of the abdomen. Mandibles for biting. Body globular

or elongate, red, hairy, usually transverse suture between seiond and third lgs. Eyes often stalked. Legs with two claws. Larva three pairs of legs. Parasitis on spiders, flies, etc.

Trombidium perscabrum Bls. Red, length 1.4 mm. Peculiar knobbed hairs. Claremont, also fresh-water pool Laguna Beach.

T. claremonti Bks. Evey's canyon near Claremont.

T. parificum Bks. Dark red. From ants' nests, and from Evey's canyon.

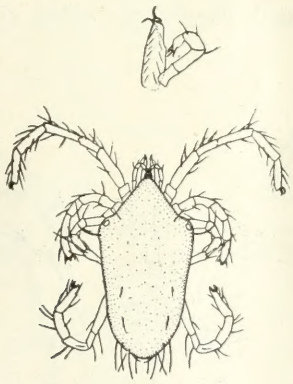
Trombidium sp. Near Camp Baldy.

HYDRACHNIDAE. Fresh-water mites. Mouth-parts not in a beak. Usually suckers near genital openings. One or two pairs of eyes. Body oval or spherical, sometimes of large size, often bright colored. Legs usually five-jointed with swimming hairs. Often attached to aquatic insects.

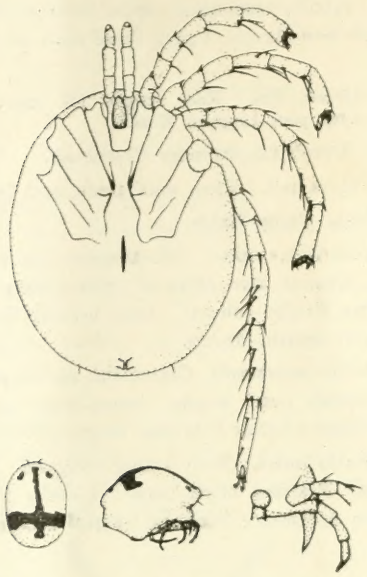
Hydrachnid. Larvæ on notonectid, Claremont, on carabid beetle Laguna Beach.

Hydracna sp. "Probably new" Banks. Large dark red-brown, spherical, found in great abundance at Laguna Lakes July and August, 1915.

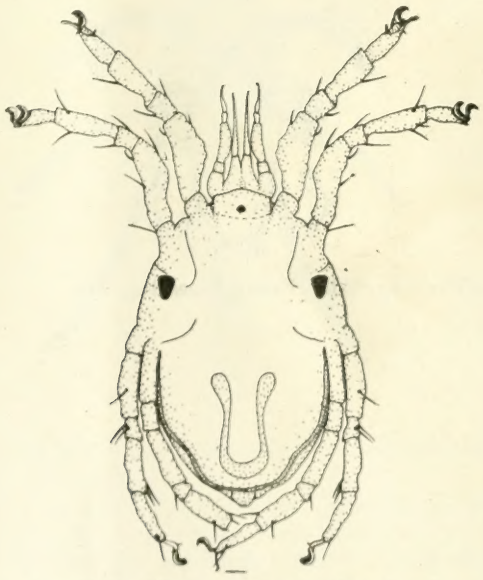
HALACARIDAE Salt-water mites. Body rather elongate. Usually a suture between the second pair of legs. Rostrum often large. Usually three eyes. No swimming hairs on legs. Mouth in a distance back, no ventral suckers. Lives upon algae.



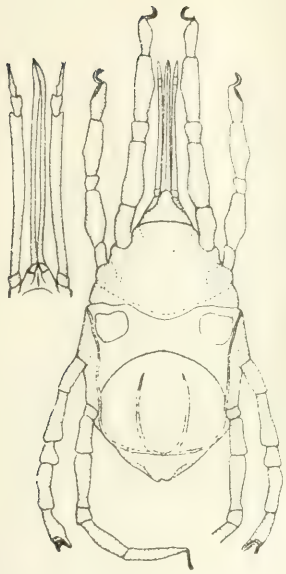
Pontacaraus californicus Hall. Under stones low tide.



Pontarachna cruciata Hall. Body highly arched globular. Laguna Beach tide pools.



Copidognathus curtus Hall. Tide pool Laguna Beach.



C. californicus Hall. Tide pool Laguna Beach.

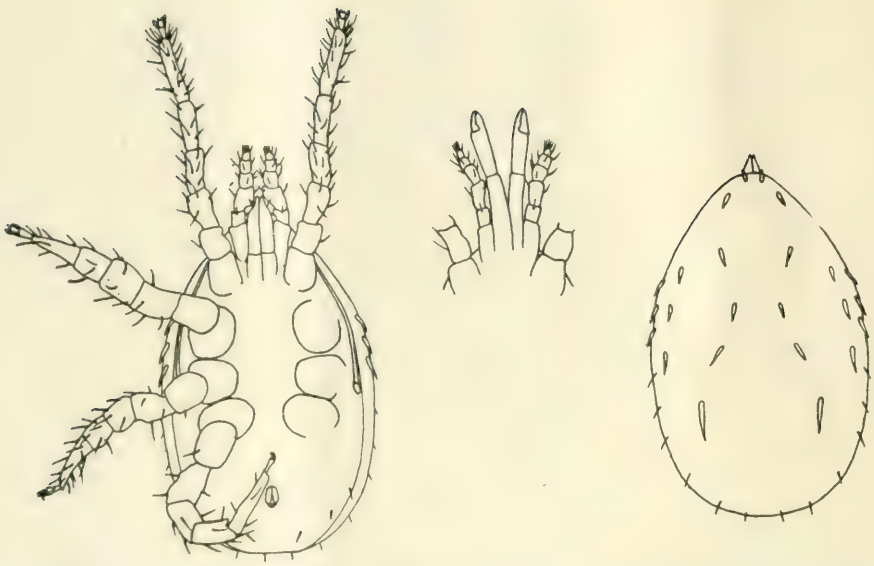
GAMASIDAE. Scavenger mites, body broad, short legs, no eyes. Mandibles usually chelate. Pedipalps five-jointed, legs six-jointed ending in two claws. First pair of legs inserted at one side of the mouth opening. Male genital opening usually on anterior margin of sternal plate.

Gamasus californicus Bks. Body yellowish, legs paler.

Parasitus frontalis Bks. From wild mouse, Laguna Beach.

Parasitus sp. Free living, Claremont, Chino.

Macrocheles sp. Chino swamp.



Seius orchestoideae Hall. Female light straw color. Male lighter. Dorsal plate over whole back. Ovoid. From the amphipod *Orchestoidea californiana*, Laguna Beach.

Laelaps pilosula Bks. Santa Rosa I.

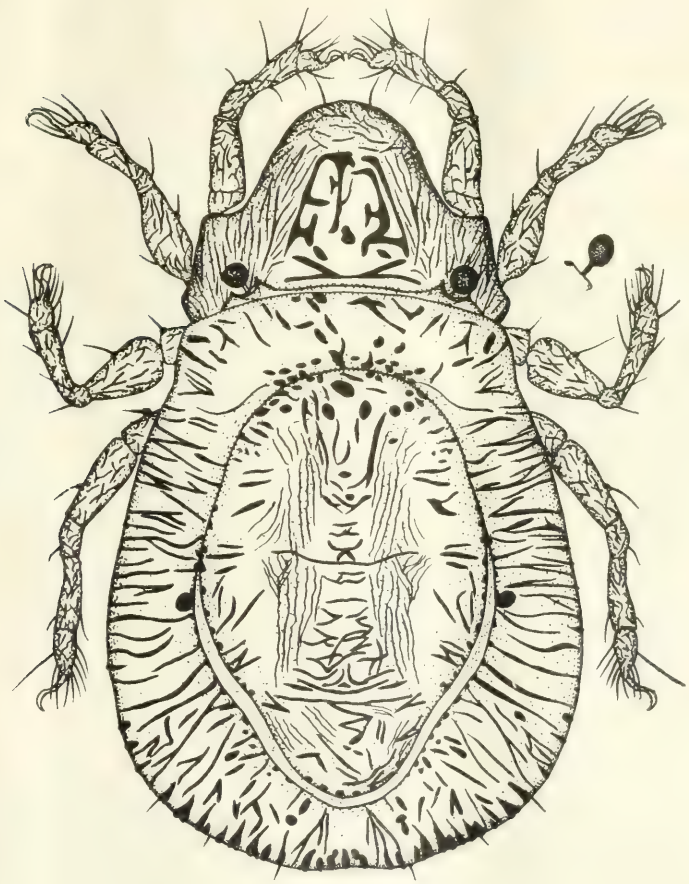
UROPODIDAE. With a distinct spiracle on lateral stigmal plate above 3-4 coxae. First pair of legs inserted in same opening as mouth-parts. Back of body extending towards and hiding mouth-parts from above.

Uropoda sp. Young on carabid beetle and on *Scolopendra.*

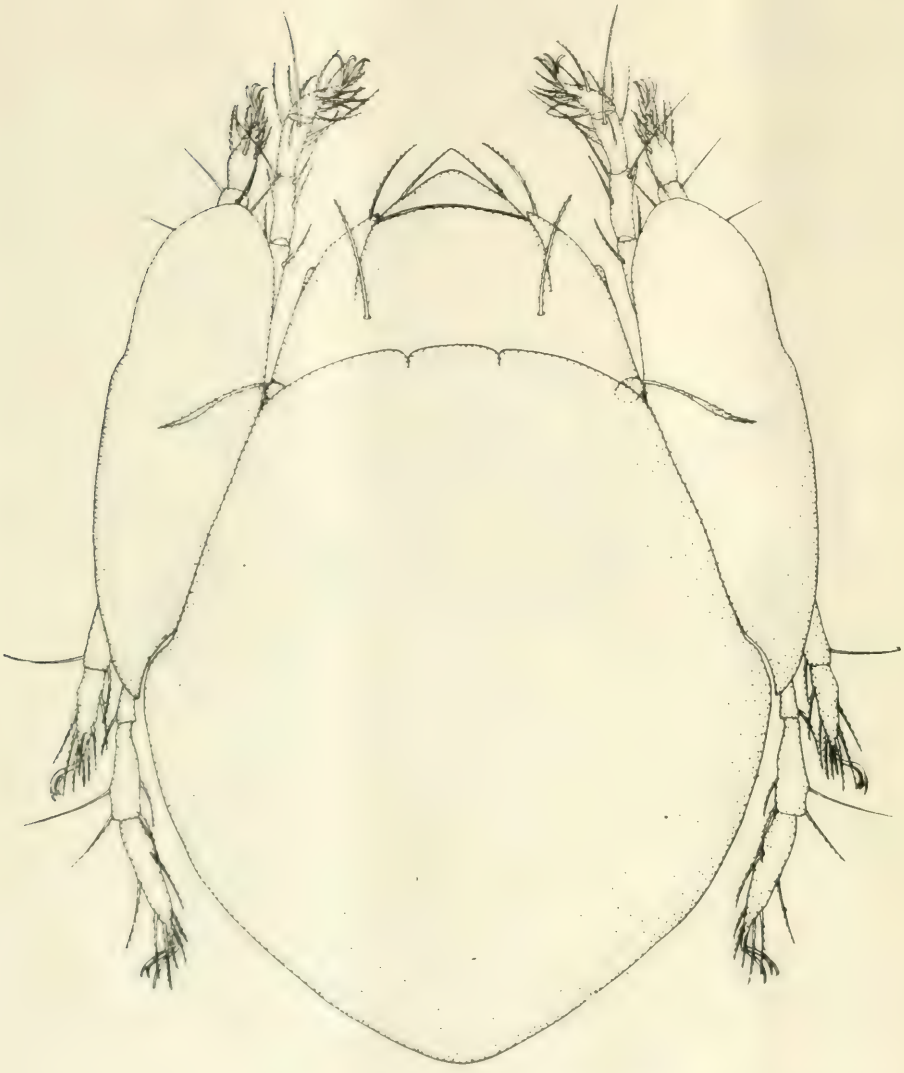
DERMANYSSIDAE. Mandibles for piercing. Body sometimes constricted. Parasitic on vertebrates.

Dermanyssus gallinae Redi. Parasitic on chickens.

ORBATIDAE. Horny beetle mites. Cephalothorax with a special hair on the posterior lateral vertex. Skin hard. Abdomen wtih wing-like expansions. Body minute, divided into two parts by transverse suture. Mouth-parts small hidden. Live upon vegetable or decaying material. Palpi five-jointed.



Hermannia hieroglyphica Hall. Brown, black markings, mandible chelate. Rough deep sculpturing. Claremont.



Oribata humida Hall. Color chestnut, polished. Abdomen with wings. Mandible chelate. Laguna Beach under board.

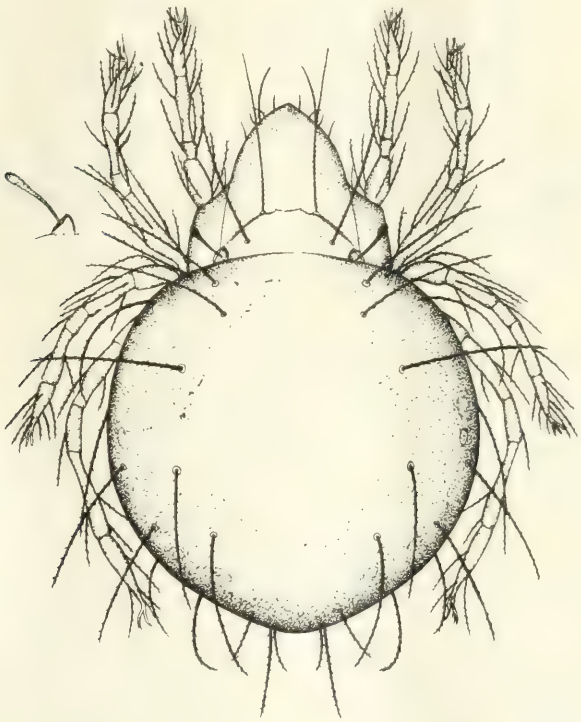
O. californica Bks. Abdomen red-brown, basal joints of legs brown, rest yellowish-brown. Cephalothorax brown. Mt. Shasta.

O. alata var. *californica* Hall. Black, polished abdomen with wings. Claremont.

Phthiracarus cryptopus Bks. Body brown, yellowish at base of abdomen. Smooth shiny, legs pale. Cephalothorax six bristles above, anterior pair shorter than others. Abdomen large high, about one-fourth longer than broad, two rows of fine hairs each side above. Legs very short and hairy. Claremont.

Eremaeus bilamellatus Hall. Claremont under leaves.

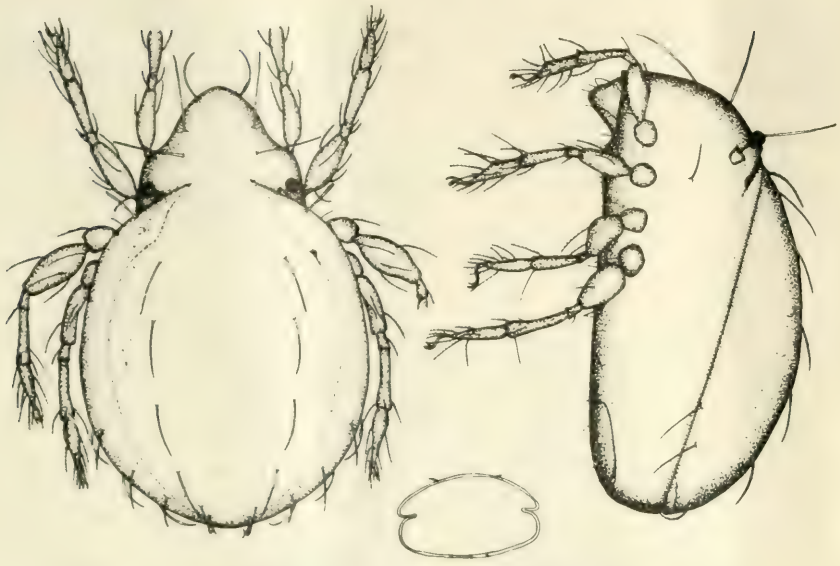
E. modestus Bks. Trunk and branches orange trees. Live upon plant life growing on trees.



Notaspis pectinata Hall. Yellow brown, smooth, polished. Claremont, Calif.

N. bilamellatus Hall. Light chestnut, smooth not polished, without wings. Mandibles large chelate. Follows Michael, near *N. burrowsi,* but differs in having no hairs on abdomen. Under stones Claremont.

N. nuda Hall. Black, smooth polished. Mandibles chelate. Under boards, Claremont.

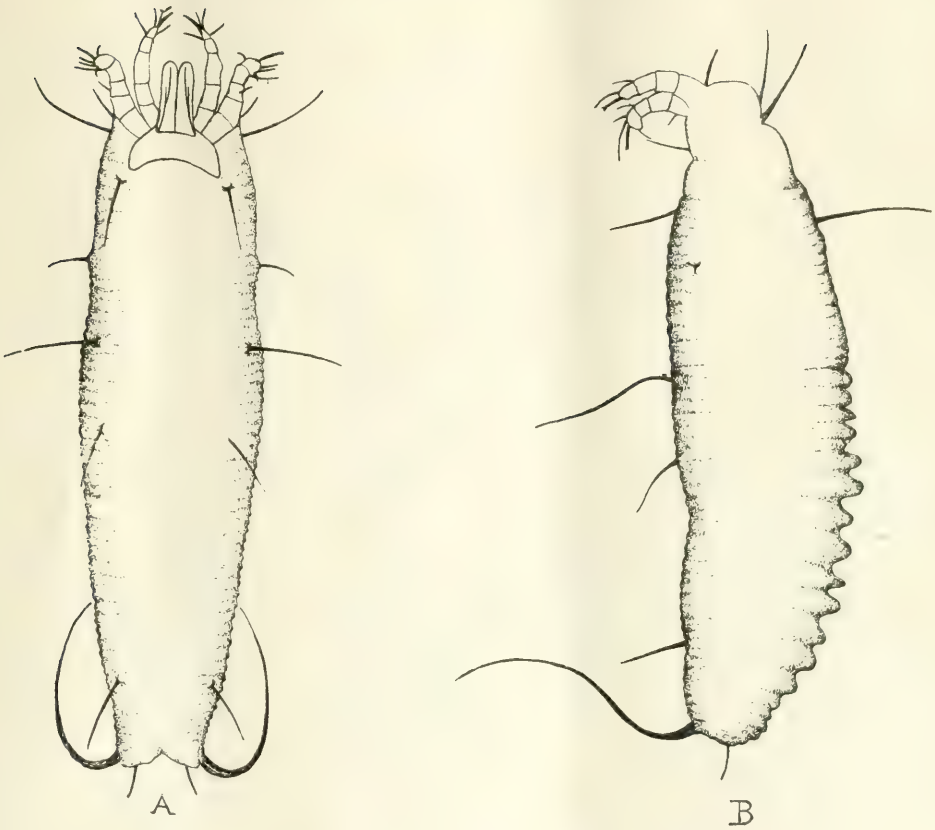


Paraliodes incurvata Hall. Dark brown, almost black, stout chelate.

Lohmannia spinosa Hall. Legs colorless, skin clear. Mandibles heavy chelate.

Tuacarus modestus Bks. Body pale, red-brown, legs pale yellow. Cephalothorax four ridges, and four bristles above.

Eriophyidae Gall mites. Body small, worm like caudal end elongate. No eyes. Two pairs of legs. Galls always open.



Paraphytoptus californicus Hall. (Possibly may be *P. peravorus.*) Gall on *Artemisia.* Abdomen anulate.

Eriophyes oleivorus Ash. Silver mite.

TARSONEMIDAE. No ventral suckers. Legs end in claws, body divided into cephalothorax and abdomen. Female with clavate hairs between legs one and two.

Tarsonemus approximatus Bks. Pomona, Calif. Under *Citricola* scale.

T. assimilis Bks. From red scale. Whittier.

TYROGLYPHIDAE. Small, elongate, smooth. Legs alike. Chelate mandibles, no eyes. Palpi close against mouth parts. Legs long, clavate hair on tarsi of one and two. Not parasitic except a few on bees. Mostly live on organic matter. Cheese mites, etc.

Tyroglyphus longior Gervais. Hairy bristles on body, long tarsi. Calif.

T. americanus Bks. From lemons in storage S. Calif.

Trichotarsus xylocopae Donn. European species found on *Xylocopa californica.*

Rhizoglyphus longistriatus var. *californicus* Hall. From Banning, injury to bark of apple tree.

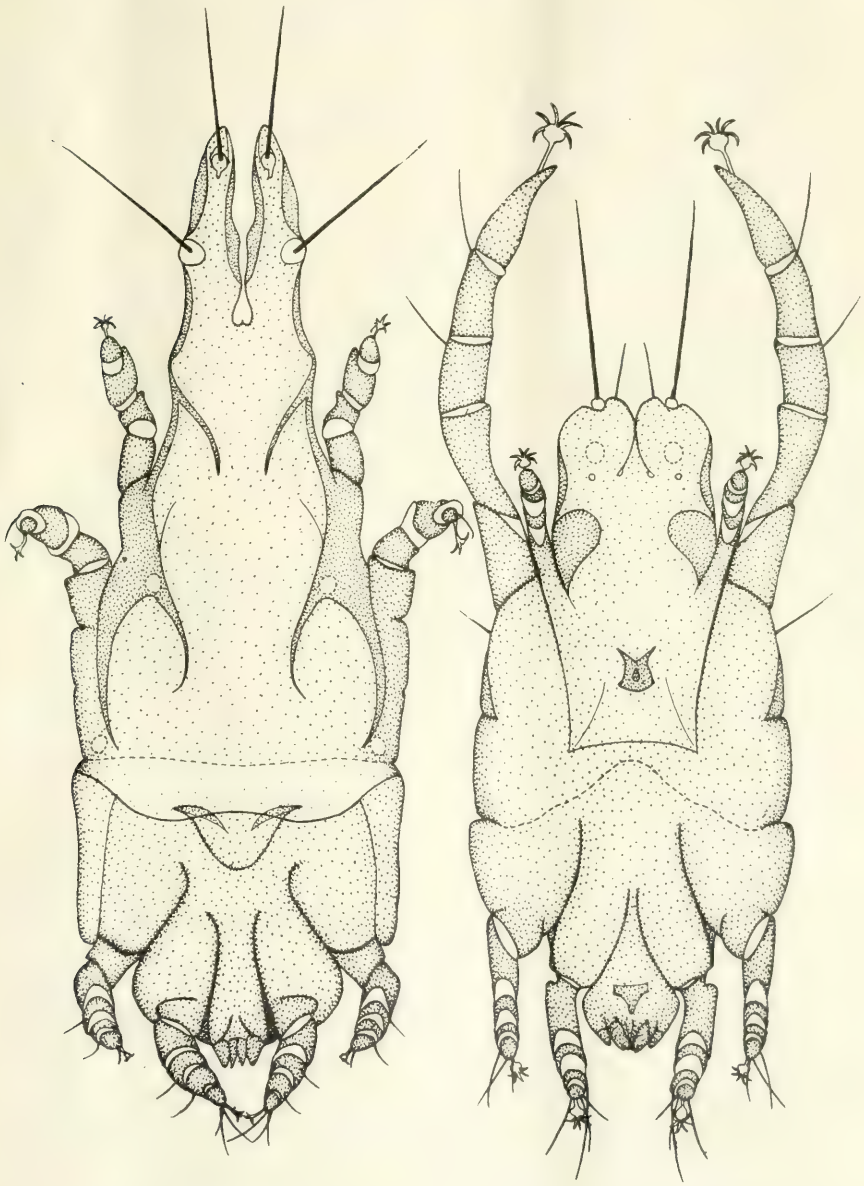
R. tarsalis Bks. Spreckels, Calif., on sugar beet.

R. rhizophagus Bks. On onions, Calif.

Glyciphagus obesus Bks. Berkeley, Calif.

Carpoglyphus passularum Hering. From Fresno on dry figs.

ANALGESTIDAE Bird mites. Small, elongate, transverse striations on the body.



Pteronyssus bifurcatus Hall. Integument strongly chitinized, from *Peterochelidon lunifrons.*

THE TICKS

ARGESIDAE. No dorsal shield, head hidden under front of body. Skin rough coxae usually contiguous or nearly so. Tarsi without apical pulvillum.

Argas miniatus Koch. Riverside.

Ornithodoros coriaceus Koch. San Francisco and Santa Clara Co.

O. megnini Dug. Red brown to black. Los Angeles.

O. talaje Guer. San Clemente Island.

IXODIDAE. Back covered by a horny shield, head distinct from the body. Anus in middle of ventral side. Skin finely striated. Tarsi with pulvillum. Male almost entirely covered with dorsal shield. Female shield only on anterior part of dorsum.

Ixodes hexagonus. Santa Clara Co., Mt. Shasta.

I. californicus Bks. Laguna Beach, Claremont, Santa Clara Co. On fox and deer, dog. Shield red-brown, paler in middle, body brownish or yellowish, coxae brown, legs paler. Few hairs. Shield long, finely punctured.

I. angustus Neum. Siskiyou Co.

I. sculptus Neum. Santa Cruz Mts., Calif.

I. pratti Bks. Claremont.

Argas miniatus Koch. Large ticks, exact location of capture not known. Calif.

Ornithodoros megnini Duges. Mt. Shasta; also S. Calif.

Dermacentor occidentalis Neum. Mts. near Claremont and foothills.

D. reticulatus Feb. Palo Alto and Mt. Shasta.

D. parumapertus Neum. Lake Side, Calif.

D. occidentalis Neum. Santa Clara Co., Humboldt Co. From deer.

Ceratixodes signatus Birula. Cormorant, Pacific Grove.

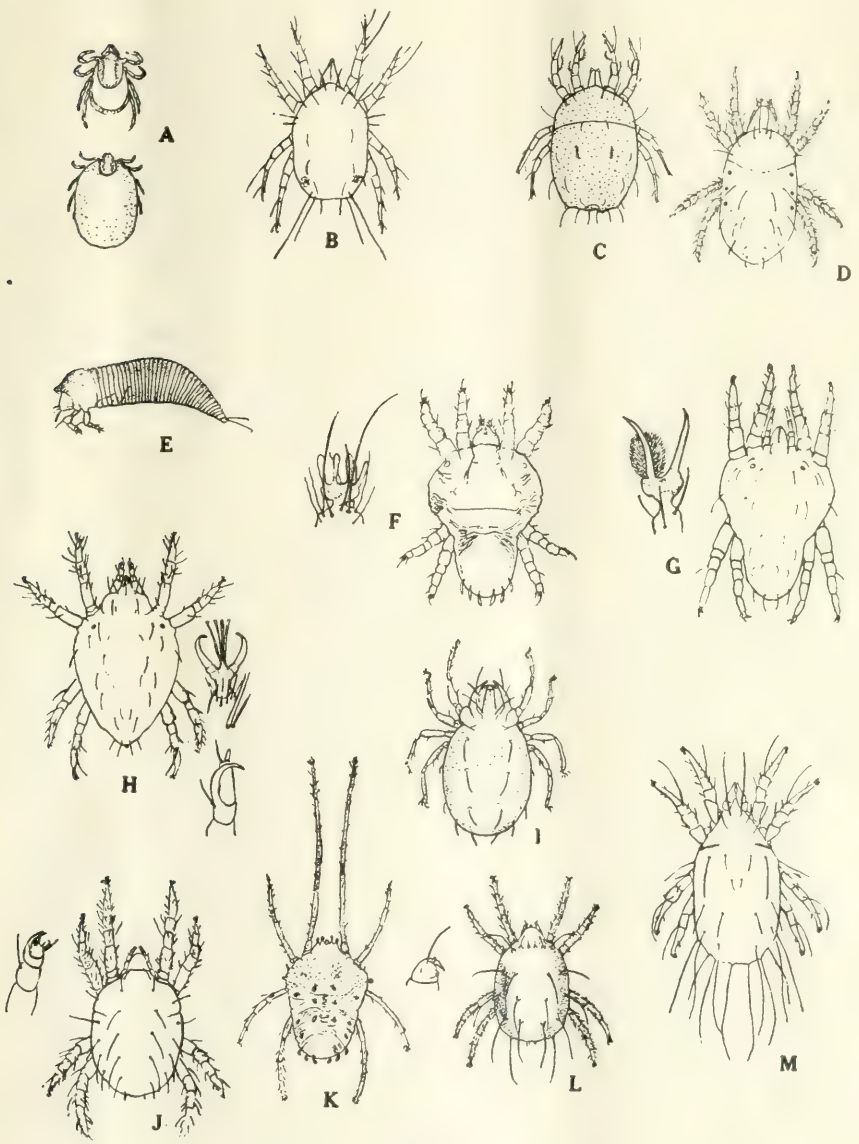
Amblyomma maculatum Koch. Tulare Co., Calif.

A. cajennense Beb. San Diego.

Haemaphysalis leporis-plaustris Pack. On rabbit, Claremont.

H. concinna Koch. Claremont, on rabbit.

Jour. Ent. Zool. VI, 1914, pp. 56-60. VIII, 1916, p. 12. Trans. Am. Ent. Soc. XXI, 1894, p. 22. Proc. Calif. Ac. Sc. Zool. III, 1904, pp. 365-369. Hubbard's Orange G. Insects 1885, p. 216. Jour. N. Y. Ent. Soc. 1904, pp. 54, 55. 1st Laguna Report. Pomona Jour. Ent. II, p. 280, III, p. 510. U. S. Dep. Agr. Tech. ser. 13, 1906, pp. 12, 20. Trans. Lin. Soc. XI, 1815, p. 397. Mem. Soc. Zool. Fr. 1899, p. 136. Arch. f. Naturges. X, 1844, pp. 219, 237. La Natur Mex. VI, 1883, p. 196. Ent. Syst. IV, 1874, p. 428. Banks, Tyroglyphidae, U. S. Dep. Agr. Tech. ser. 13, 1906. Banks, Iodoidea, U. S. Dep. Agr. Tech. ser. 15, 1908. Banks, Acarina U. S. Nat. Mus. 1904. Quayle, Red spiders and mites of citrus trees, Bull. 234, Berkeley, 1912.



IXODIDAE A. *Haemaphysalis leporis-palustris,* fresh and gorged female. TYROGLYPHIDAE B. *Carpoglyphus passularum,* C. *Glyciphagus obesus.* ERIOPHYIDAE E. *Eriophyes oleivorus.* TETRANYCHIDAE D. *Tetranychus sexmaculatus,* F. *Tenuipalpus californicus,* G. *Tetranychoides californicus,* H. *Caligonus terminalis,* J. *Tetranychus bimaculatus,* K. *Bryobia pratensis,* L. *Tetranychus mytilaspidis.* ORBATIDAE I. *Eremaeus modestus.* TYROGLYPHIDAE M. *Tyroglyphus americanus.*

VI. Nemertinea

The first work of any importance which deals with the nervous system of these worms is that of De Quatrefages in 1846. He describes the central nervous system as composed of two distinct lateral lobes united below and above by commissures. From the lateral lobes two more or less isolated longitudinal bands extend themselves towards the posterior end of the animal. So far as the figures are concerned this early work is even more detailed than that of M'Intosh in 1873. The more recent information about this interesting group has been furnished especially by Hubrecht in numerous papers from 1875 to 1887. Although the cellular details are not shown, the relative position of the central fibrous core is given in relation to the surrounding nerve cells. He also clearly distinguishes the dorsal median nerve springing from the slender dorsal commissure. The dorsal and ventral lobes of the brain are shown more clearly than in earlier writings. In *Eupolia* a dorsal, middle and ventral lobe are shown.

Hubrecht in his two papers of 1887 suggests the nemertineans as a group of animals valuable in tracing the relationship of the vertebrates and invertebrates. He bases his hypothesis largely upon the arrangement of the parts of the nervous system. In the group there is some variation in the extent and position of the lateral nerve cords and in some, the mouth opens behind the brain and in some in front of the brain. Such facts as these give suggestions of an intermediate condition between annelids and arthropods on the one side and vertebrates on the other. Other writers have compared the large lateral nerves of nemertineans with the central nerve cords of some round worms.

Bürger in a number of works from 1883 to 1895, has made a considerable study of the nervous system by various methods. He has also studied the histological details of the nervous system. His papers are the most comprehensive and important in this field. Bürger describes the nerve cells as all unipolar and uninclosed in special membranes. He classifies nerve cells as follows: (1) The smallest cells sensory in nature; (2) medium sized cells; (3) large cells; (4) very large cells, the so-called "Neurocorde" cells.

Montgomery, 1897, agrees with Bürger in many respects, such as unipolar condition of the nerve fibers, but these are composed of "a homogeneous unstaining axis cylinder which is probably fluid and a fine spongioplasmic layer."

In *Cerebratulus*, the large nerve fibers differ from the others in size. They do not give off collaterals but divide dichotomously and are arranged segmentally. The largest ganglion cells are present in three pairs in the ventral brain lobes and are distributed irregularly along the lateral cords, but are absent in both ends. In the

lateral cords they increase in number posteriorly and are more abundant on the dorsal side. In each lateral cord both dorsally and ventrally are radial clusters of medium sized cells showing a bilateral arrangement.

Haller, 1889, shows a neuroglia network in *Cerebratulus* and an anastomosis between the branches of multipolar ganglion cells.

The nemertineans are divided into groups somewhat by the position of the nervous system in relation to the body-wall. The more primitive condition seems to be when the brain and chief branches are outside the muscle layers, in the epithelium or below the basement membrane. In some the nervous system is found in the muscle layers of the body-wall and in others the brain and chief nerves lie in the parenchyma internal to the muscle layers.

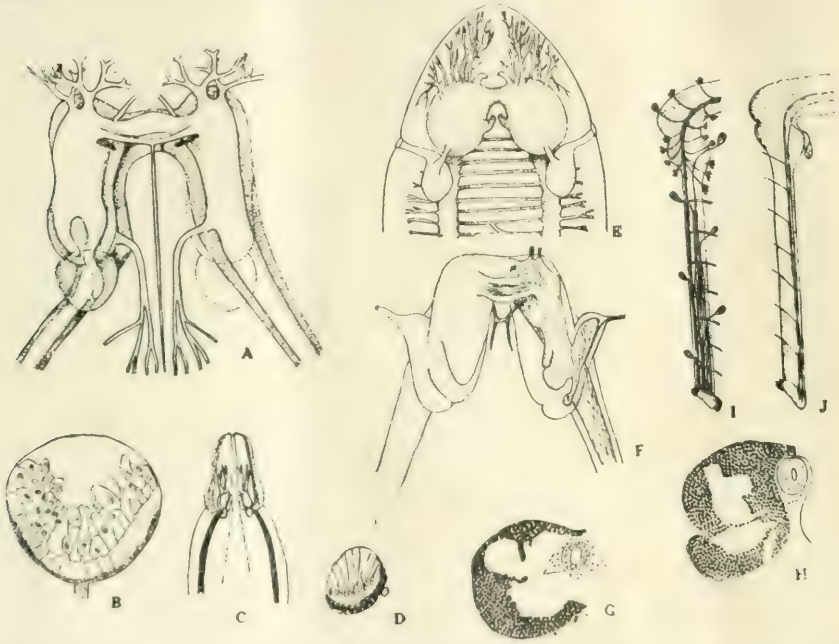


Fig. 13. NERVOUS SYSTEM AND SENSE ORGANS OF NEMERTINEA. A. Nervous system of *Cerebratulus* showing chief nerves and the position of the central fibrous mass, Hubrecht. B. Section of eye of *Drepanophorus*, Hubrecht. C. Diagram of head end of *Cerebratulus*. D. Section of eye of *Lineus, Punnett*. E. Brain of *Drapanophorus*, Hubrecht. F. Brain of *Eupolia*, showing fibrous core on the right, Hubrecht. G, H. Cross sections through brain of *Eupolia*, left side and oesophagus shown in each. I, J. Scheme of some nerve cells and fibers in the lateral cord and ventral ganglion in *Anopla*, and *Drepanophorus*, Bürger.

Hubrecht, '87, suggests that the more primitive nervous system of these animals has a most complicated intricate network of peri-

pheral nerve tissue. This network suggests the "most ancient arrangement of the nervous tissue." In the more highly specialized forms, the brain and lateral nerves are more concentrated. Probably all nemertineans have more or less peripheral nerve networks even though Hubrecht might not have seen them by his methods, but the fact remains that those forms in which the network is especially marked are more primitive because of it. Montgomery believes that Haller is mistaken as to the multipolar condition of these cells.

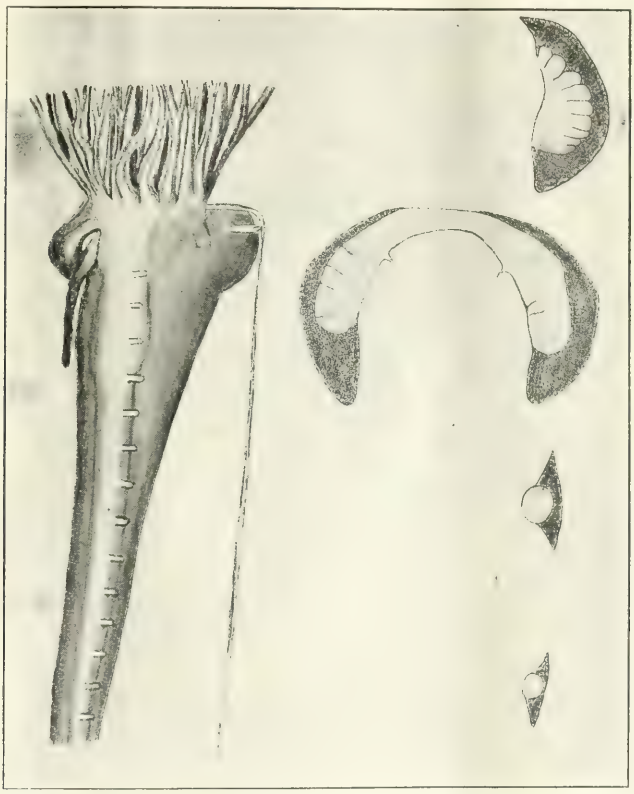


Fig. 14. Reconstruction of the nervous system of *Carinella* shown from the ventral side. Figure at the left, side view of a reconstruction of the upper portion of the central nervous system of *Carinella*. The figures at the right are from cross section taken at various levels. The upper and the two lower figures are from one side only. X75, Hilton.

In general the central nervous system of the Nemertinea is as follows: A brain composed of two ganglionic masses at the anterior end of the body, on on each side of the proboscis. These are united

by ventral and dorsal commissures passing about the proboscis. The dorsal band is often more slender than the ventral and from it a slender dorsal nerve runs the length of the body. Each lateral brain lobe is often partly divided into a dorsal and ventral lobe. From each lateral ganglion a large nerve trunk passes back and may unite with its fellow of the opposite side just above the anus.

Nerves are given off from the brain to the eyes when present, and to anterior portions of the body. Two branches come off from the dorsal commissure and run to the proboscis. The so-called vagus nerves arise from the internal borders of the brain not far from the origin of the lateral cords. They are sometimes united by a commissure and then pass down the oesophagus.

Eyes are usually present along the sides of the head, sometimes a single pair, at other times one or more groups on each side. The eyes in their simplest conditions are mere pigment spots, in others there is a clear area filled with fluid which is supported by strands from cells and held by a limiting membrane. Sensory cells are connected with the brain by fibers and with pigment at the outer side. The sensory area seems to be like rods in certain forms.

In some cases otocysts have been found on the surface of the brain. At the anterior tip of the head groups of cells bear long bristles. In some, these areas are retractile. Taste has been suggested as the function of these "frontal" organs. The so-called "side" organs occur as a pair of epithelial patches on each side of the body in the region of the excretory pore. These have an abundant nerve supply but their function is unknown.

In most forms a peculiar pair of organs is found in the head region in close connection wtih the brain. Hubrecht suggests that they may be respiratory. Bürger thought that they might be organs used for determining the condition of the water. They may be shallow depressions, longitudinal or slit-like or the slit may be at right angles to the body. In some, ciliated ducts pass inwards and penetrate into special lobes called the *cerebral organs*.

Thompson, 1908, in *Cerebratulus lacteus* finds six ventral commissures from the ventral lobes of the brain. Some of these come from the fibrous core and some come from the cellular sheath of the brain. Other commissures are found beyond the brain.

Six pairs of "neurocord" cells and one unpaired cell are found in the ventral lobes of the brain. There is probably individual variation as to their number.

The brain is complex but resembles in its form and commissures that of the tubularian worms.

Coe and Ball, 1920, in *Nectonemertes*, find both dorsal and ventral commissures well developed. Cerebral and frontal organs are lacking.

In the blastula of *Cerebratulus* cells on the apex of the larvae develop cilia and sink below the general surface. This forms the apical sense organ of the larva.

The brain of the adult develops by thickenings of the apical discs.

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